E 1.28:SOLAR/1087-78/12

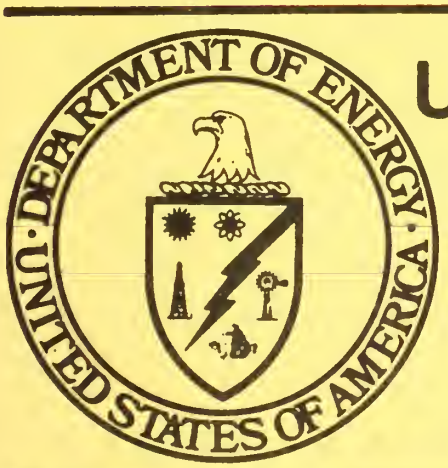
Aleph 1215874

SOLAR/1087-78/12

Monthly Performance Report

ORTIZ & REILL DEVELOPERS, INC.
HOUSE LOT 8

DECEMBER 1978



U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

MONTHLY PERFORMANCE REPORT

ORTIZ & REILL DEVELOPERS, INC.
HOUSE LOT 8

DECEMBER 1978

I. SYSTEM DESCRIPTION

Ortiz & Reill Developers, Inc., House Lot 8, is one of two instrumented single-family residences in Escondido, California. The home has approximately 1536 square feet of conditioned space. Solar energy is used for domestic-hot-water (DHW) heating and space heating. The solar energy system has an array of flat-plate collectors with a gross area of 192 square feet. The array faces 29 degrees east of south at an angle of 45 degrees to the horizontal. Water is the transfer medium that delivers solar energy from the collector array to storage and to the space heating and hot water loads. Solar energy is stored in a 750-gallon tank located in the ground floor utility room. Heated city water is stored in a 66-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, a gas furnace provides auxiliary energy for space heating. Similarly, an electrical heating element in the DHW tank provides auxiliary energy for DHW heating. Energy from an hydronic fireplace radiates directly into the living space. This energy supplements solar modes 1 and 2. The fireplace-to-storage mode activates if the fireplace is being used, the temperature difference between its water plenum and storage output is more than 9°F, and there is no demand for space heating. During operation, water is circulated from storage through the fireplace heat exchanger. The system, shown schematically in Figure 1, has four modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the outlet of the collector array exceeds that of the bottom of the storage tank by more than 9°F. Water is circulated from the tank through the collectors until the temperature differential is less than 3°F.

Mode 2 - Storage-to-Space Heating: This mode activates when the manually preset thermostat located in the heated space indicates a demand for space heating. Heated water is circulated from storage through a heat exchanger in the air-handling unit and returned to storage. If the demand cannot be satisfied by energy from storage, the gas furnace is activated to provide auxiliary heat. The fireplace can also add energy to the water circulating from storage before it enters the air-handling unit. If the fireplace is being used and the temperature difference between its water plenum and storage output is more than 9°F, valve D400 is activated and energy is added to the water from the fireplace heat exchanger.

Mode 3 - Storage-to-DHW: This mode activates when there is a temperature difference exceeding a pre-set differential between storage and the DHW tank and there is no demand for space heating. Incoming city water enters the DHW tank, where it is heated by water circulating from storage through a heat exchanger in the tank.

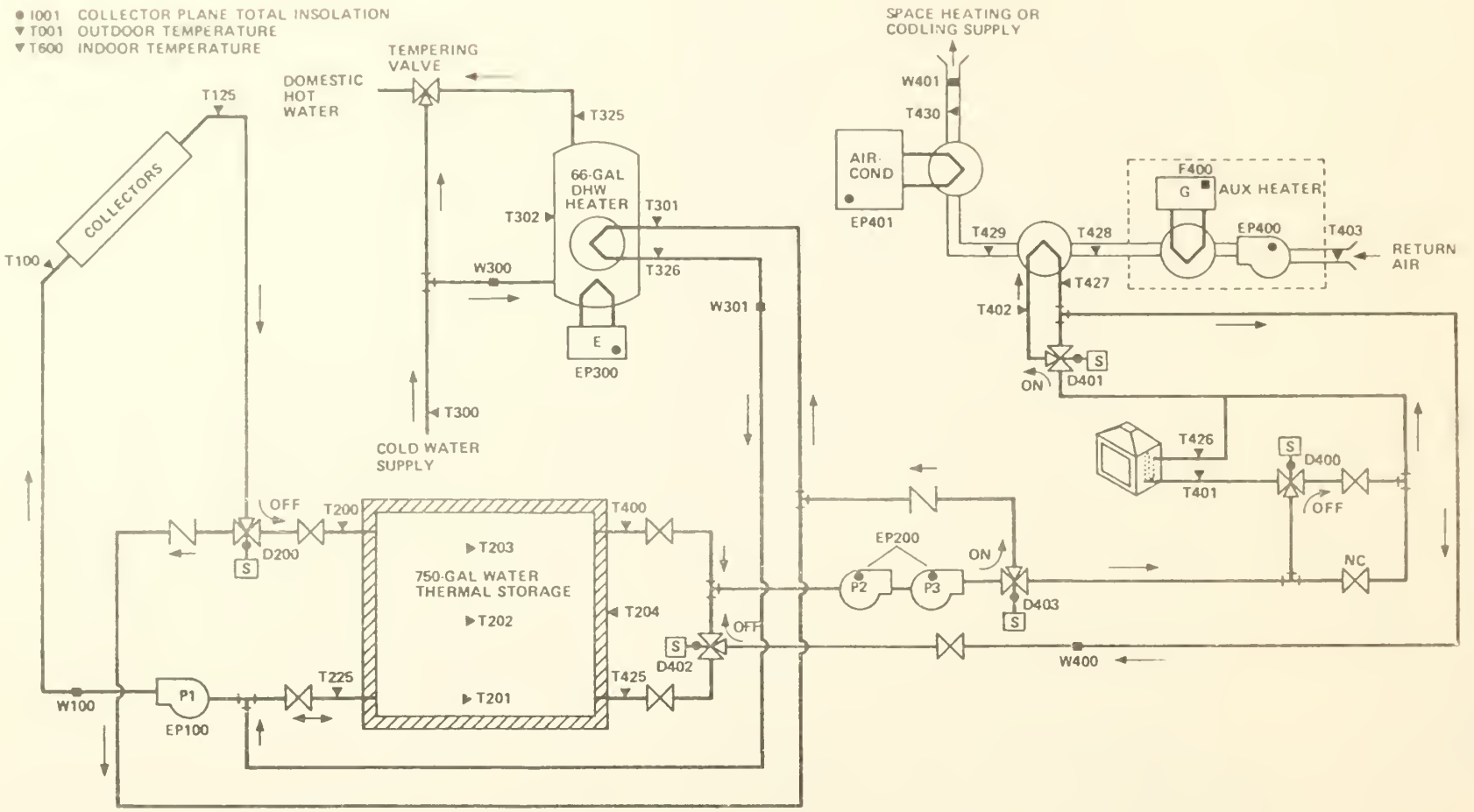


Figure 1. ORTIZ AND REILL DEVELOPERS, INC., LOT NO. 8 SOLAR ENERGY SYSTEM SCHEMATIC

Mode 4 - Collector-to-DHW: This mode activates when the temperature in the DHW tank falls below 140°F and the collector output temperature exceeds the DHW tank temperature. Water circulates through the heat exchanger in the DHW tank and returns to the collectors.

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was occupied in December and the solar energy system operated continuously for 31 days. Solar energy satisfied 44 percent of the DHW requirements and 10 percent of the space heating requirements. The solar energy system provided electrical savings of 0.23 million Btu and a fossil fuel energy savings of 0.20 million Btu. Evaluation was not performed for seven days in December because of problems with data resolution.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 9.1 million Btu for a daily average of 1535 Btu per square foot. This was above the estimated average daily solar radiation for this geographical area during December of 1456 Btu per square foot for a plane facing 29 degrees east of south with a tilt of 45 degrees to the horizontal. The average ambient temperature during December was 50°F as compared with the long-term average for December of 57°F. The number of heating degree-days for the month (based on a 65°F reference) was 411, as compared with the long-term average of 257.

THERMAL PERFORMANCE

Collector - The total incident solar radiation on the collector array for the month of December was 9.1 million Btu. During the period the collector loop was operating the total insolation amounted to 5.4 million Btu. The total collected solar energy for the month of December was 2.1 million Btu, resulting in a collector array efficiency of 23 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 1.0 million Btu, while solar energy delivered from the collector array directly to the loads amounted to 0.37 million Btu. Energy loss during transfer from the collector array to storage and loads was 0.73 million Btu. This loss represented 35 percent of the energy collected. Operating energy required by the collector loop was 0.063 million Btu.

Storage - Solar energy delivered to storage was 1.0 million Btu and auxiliary energy contribution to storage was 0.03 million Btu. There were 0.33 million Btu delivered from storage to the DHW and space heating subsystems. Energy loss from storage was 0.69 million Btu. This loss represented 69 percent of the solar energy delivered to storage. The storage efficiency was 39 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 93°F.

DHW Load - The DHW subsystem consumed 0.45 million Btu of solar energy and 0.61 million Btu of auxiliary electrical energy to satisfy a hot water load of 1.1 million Btu. The solar fraction of this load was 44 percent. The DHW subsystem consumed a total of 0.16 million Btu of operating energy, resulting in an electrical energy savings of 0.30 million Btu. The amount of solar energy used by the DHW subsystem is believed to be slightly greater than indicated. This discrepancy is attributed to both the problems in data resolution and to temperature resolution limitations caused by small temperature differentials which frequently changed direction. The DHW solar fraction and energy savings are believed to be slightly greater than indicated for the same reasons. A daily average of 64 gallons of DHW was consumed at an average temperature of 133°F delivered from the tank.

Space Heating Load - The space heating subsystem consumed 0.12 million Btu of solar energy and 1.14 million Btu of auxiliary thermal energy (equivalent to 1.8 million Btu of auxiliary fossil fuel energy) to satisfy a space heating load of 1.3 million Btu. The solar fraction of this load was 10 percent. The slightly lower values of space heating load shown in the accompanying tables is attributed to the problems in data resolution. The space heating subsystem consumed a total of 0.25 million Btu of operating energy, resulting in an electrical energy expense of 0.007 million Btu and a fossil fuel energy savings of 0.20 million Btu.

OBSERVATIONS

In satisfying 26 percent of the combined DHW and space heating demand, a total of 1.6 million Btu were lost from the system. Transport losses between collector array and storage added to those between collector array and DHW heat exchanger, totalled 0.73 million Btu. Transport losses between storage and DHW heat exchanger added to energy loss between storage and the space heating exchanger, totalled 0.13 million Btu. Thermal losses from the storage tank accounted for 0.69 million Btu. The system loss represented 76 percent of the energy collected.

On several days during the month, the control system permitted operation in the storage-to-DHW mode when the storage temperature was low relative to the DHW tank temperature, resulting in the transport of energy from the DHW tank. This switching of energy flow direction resulted in small temperature differences between heat exchanger inlet and outlet temperatures in the DHW subsystem. Occasionally, these differences were so small that they could not be correctly resolved in either magnitude or direction. This lack of resolution is believed to have resulted in lower-than-actual values for solar energy used by the DHW subsystem. Hot water solar fraction and DHW energy savings are also impacted by this underprediction.

ENERGY SAVINGS

The solar energy system provided a total electrical energy savings of 0.23 million Btu and a fossil fuel energy savings of 0.20 million Btu. The space heating subsystem contributed a fossil fuel energy savings of 0.20 million Btu.

III. ACTION STATUS

The grantee is investigating control system improvements. No additional action is planned at this time.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: ORTIZ AND REILL, LOT 8 ESCONDIDO, CALIFORN
REPORT PERIOD: DECEMBER,1978

SITE/SYSTEM DESCRIPTION:
ORTIZ AND REILL IS A SINGLE FAMILY DWELLING. THE SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND DOMESTIC HOT WATER HEATING. WATER IS USED AS THE ENERGY COLLECTION AND STORAGE MEDIUM. SOLAR ENERGY IS SUPPLIED TO THE DHW TANK THROUGH A HEAT EXCHANGER WHICH CONNECTS TO THE COLLECTION LOOP OR TO THE STORAGE TANK. ELECTRICAL RESISTANCE COILS PROVIDE AUXILIARY ENERGY AS REQUIRED. SOLAR ENERGY IS SUPPLIED TO THE SPACE HEATING SYSTEM FROM THE STORAGE TANK. A FIREPLACE AND A GAS FIRED FURNACE PROVIDE AUXILIARY ENERGY AS REQUIRED.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	9.138 MILLION BTU
	47596 BTU/SQ.FT.
COLLECTED SOLAR ENERGY	2.110 MILLION BTU
	10987 BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	50 DEGREES F
AVERAGE BUILDING TEMPERATURE	70 DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.06
ECSS OPERATING ENERGY	0.063 MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.466 MILLION BTU
TOTAL ENERGY CONSUMED	4.964 MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	1.115	1.248	N.A.	2.406 MILLION BTU
SOLAR FRACTION	44	10	N.A.	26 PERCENT
SOLAR ENERGY USED	0.450	0.121	N.A.	0.571 MILLION BTU
OPERATING ENERGY	0.155	0.247	N.A.	0.466 MILLION BTU
AUX. THERMAL ENERGY	0.608	1.137	N.A.	1.735 MILLION BTU
AUX. ELECTRIC FUEL	0.608	N.A.	N.A.	0.608 MILLION BTU
AUX. FOSSIL FUEL	N.A.	1.798	N.A.	1.798 MILLION BTU
ELECTRICAL SAVINGS	0.295	-0.007	N.A.	0.225 MILLION BTU
FOSSIL SAVINGS	N.A.	0.202	N.A.	0.202 MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.448

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: ORTIZ AND REILL, LOT 8 ESCONDIDO, CALIFORN SCLAR/1087-78/12
REPORT PERIOD: DECEMBER,1978

SITE/SYSTEM DESCRIPTION:
ORTIZ AND REILL IS A SINGLE FAMILY DWELLING. THE SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND DOMESTIC HOT WATER HEATING. WATER IS USED AS THE ENERGY COLLECTION AND STORAGE MEDIUM. SOLAR ENERGY IS SUPPLIED TO THE DHW TANK THROUGH A HEAT EXCHANGER WHICH CONNECTS TO THE COLLECTION LOOP OR TO THE STORAGE TANK. ELECTRICAL RESISTANCE COILS PROVIDE AUXILIARY ENERGY AS REQUIRED. SOLAR ENERGY IS SUPPLIED TO THE SPACE HEATING SYSTEM FROM THE STORAGE TANK. A FIREPLACE AND A GAS FIRED FURNACE PROVIDE AUXILIARY ENERGY AS REQUIRED.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	9.641	GIGA JOULES
	540496	KJ/SQ.M.
COLLECTED SOLAR ENERGY	2.226	GIGA JOULES
	124769	KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	10	DEGREES C
AVERAGE BUILDING TEMPERATURE	21	DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.06	
ECSS OPERATING ENERGY	0.067	GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.491	GIGA JOULES
TOTAL ENERGY CONSUMED	5.237	GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	1.176	1.317	N.A.	2.538 GIGA JOULES
SOLAR FRACTION	44	10	N.A.	26 PERCENT
SOLAR ENERGY USED	0.475	0.128	N.A.	0.603 GIGA JOULES
OPERATING ENERGY	0.164	0.261	N.A.	0.491 GIGA JOULES
AUX. THERMAL ENG	0.642	1.199	N.A.	1.831 GIGA JOULES
AUX. ELECTRIC FUEL	0.642	N.A.	N.A.	0.642 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	1.897	N.A.	1.897 GIGA JOULES
ELECTRICAL SAVINGS	0.311	-0.008	N.A.	0.237 GIGA JOULES
FOSSIL SAVINGS	N.A.	0.213	N.A.	0.213 GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.448

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SCLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: ORTIZ AND REILL, LOT 8 ESCONDIDO, CALIFORN SOLAR/1087-78/12
REPORT PERIOD: DECEMBER,1978

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.054	52	0.056	0.000	0.000	N	1.034
2	0.379	51	0.028	0.000	0.004	O	0.074
3	0.388	50	0.027	0.000	0.004	T	0.071
4	0.378	52	0.021	0.000	0.003		0.055
5	0.074	49	0.014	0.000	0.000	A	0.190
6	0.380	43	0.065	0.000	0.003	P	0.171
7	0.369	41	0.021	0.000	0.003	P	0.057
8	0.381	44	0.000	0.000	0.001	L	0.000
9	0.378	47	0.000	0.000	0.003	I	0.000
10	0.366	58	0.000	0.000	0.004	C	0.000
11	0.423	61	0.000	0.000	0.004	A	0.000
12	*	*	*	*	*	B	*
13	0.378	57	0.019	0.000	0.000	L	0.052
14	0.347	56	0.018	0.000	0.003	E	0.051
15	0.119	50	0.006	0.000	0.000		0.048
16	0.185	55	0.000	0.000	0.000		0.000
17	0.029	55	0.000	0.000	0.000		0.000
18	0.036	50	0.000	0.000	0.000		0.000
19	0.220	45	0.000	0.000	0.000		0.000
20	0.336	45	0.030	0.000	0.001		0.088
21	0.280	47	0.000	0.000	0.000		0.000
22	0.351	50	0.027	0.025	0.003		0.076
23	0.507	52	0.029	0.000	0.005		0.057
24	*	*	*	*	*		*
25	*	*	*	*	*		*
26	*	*	*	*	*		*
27	*	*	*	*	*		*
28	*	*	*	*	*		*
29	*	*	*	*	*		*
30	0.370	51	0.035	0.000	0.005		0.096
31	0.346	48	0.046	0.001	0.004		0.134
SUM	9.138	-	0.571	0.033	0.063	N.A.	-
AVG	0.295	50	0.018	0.001	0.002	N.A.	0.063
NBS ID	G001	N113			G102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: ORTIZ AND REILL, LOT 8 DESIGNATION, CASOLAR/1087-78/12
REPORT PERIOD: DECEMBER,1978

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.054	0.000	0.000	58	0.000
2	0.379	0.327	0.132	67	0.349
3	0.388	0.322	0.135	68	0.348
4	0.378	0.289	0.133	70	0.351
5	0.074	0.002	0.000	57	0.000
6	0.380	0.257	0.130	53	0.343
7	0.369	0.263	0.113	52	0.307
8	0.381	0.072	0.043	52	0.112
9	0.378	0.242	0.089	64	0.236
10	0.365	0.256	0.087	74	0.238
11	0.423	0.211	0.000	*	0.000
12	*	*	*	*	*
13	0.378	0.000	0.000	79	0.000
14	0.347	0.279	0.140	76	0.405
15	0.119	0.000	0.000	66	0.000
16	0.185	0.000	0.000	69	0.000
17	0.029	0.000	0.000	*	0.000
18	0.036	0.000	0.000	*	0.000
19	0.220	0.000	0.000	50	0.000
20	0.336	0.151	0.114	*	0.338
21	0.280	0.000	0.002	63	0.006
22	0.351	0.329	0.144	70	0.409
23	0.507	0.462	0.130	69	0.256
24	*	*	*	*	*
25	*	*	*	*	*
26	*	*	*	*	*
27	*	*	*	*	*
28	*	*	*	*	*
29	*	*	*	*	*
30	0.370	0.366	0.119	66	0.322
31	0.346	0.339	0.122	65	0.353
SUM	5.138	5.434	2.110	-	-
AVG	0.295	0.175	0.068	64	0.231
NBSID	G001		G100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: ORTIZ AND REILL, LOT 8 ESCONDIDO, CASOLAR/1087-78/12
REPORT PERIOD: DECEMBER,1978

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.000	0.076	-0.087	109	1.000
2	0.066	0.021	0.047	103	1.029
3	0.071	0.010	0.044	111	0.769
4	0.089	0.035	0.039	119	0.836
5	0.000	0.021	-0.209	103	1.000
6	0.081	0.012	0.016	86	0.355
7	0.060	0.000	0.029	91	0.478
8	0.049	0.000	0.006	93	0.123
9	0.070	0.000	0.026	96	0.371
10	0.062	0.000	0.023	100	0.367
11	0.000	0.000	-0.032	99	1.000
12	*	*	*	*	*
13	0.000	0.034	-0.044	87	1.000
14	0.068	0.015	0.030	86	0.509
15	0.000	0.011	-0.032	86	1.000
16	0.000	0.000	-0.020	81	1.000
17	0.000	0.000	-0.013	78	1.000
18	0.000	0.000	-0.012	76	1.000
19	0.000	0.000	-0.014	74	1.000
20	0.015	0.000	0.145	86	9.769
21	-0.004	0.000	-0.049	95	12.637
22	0.089	0.008	0.105	96	1.265
23	0.039	0.000	0.024	108	0.628
24	*	*	*	*	*
25	*	*	*	*	*
26	*	*	*	*	*
27	*	*	*	*	*
28	*	*	*	*	*
29	*	*	*	*	*
30	0.018	0.002	0.011	86	0.717
31	0.028	0.006	0.030	89	1.311
SUM	1.059	0.326	0.083	-	-
AVG	0.034	0.011	0.003	93	0.386
NES ID	G200	G201	G202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: ORTIZ AND REILL, LOT 8 ESCONDIDO, CALIFORN SOLAR/1087-78/12
REPORT PERIOD: DECEMBER,1978

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.045	88	0.014	0.011	0.014	0.014	N	0.003	N	67	133	85
2	0.044	71	0.028	0.010	0.022	0.022	O	0.018	O	70	133	85
3	0.026	73	0.028	0.009	0.001	0.001	T	0.019	T	70	136	49
4	0.025	75	0.021	0.010	0.004	0.004		0.011		68	134	46
5	0.028	78	0.014	0.011	0.007	0.007	A	0.003	A	68	131	54
6	0.046	55	0.018	0.009	0.035	0.035	P	0.009	P	63	125	89
7	0.026	43	0.021	0.007	0.020	0.020	P	0.014	P	66	121	52
8	0.030	45	0.000	0.000	0.027	0.027	L	0.000	L	65	122	58
9	0.035	19	0.000	0.000	0.043	0.043	I	0.000	I	65	125	80
10	0.021	9	0.000	0.000	0.028	0.028	C	0.000	C	70	132	39
11	0.037	8	0.000	0.000	0.024	0.024	A	0.000	A	68	136	63
12	*	*	*	*	*	*	B	*	B	*	*	*
13	0.046	22	0.019	0.013	0.009	0.009	L	0.007	L	69	131	84
14	0.033	37	0.018	0.010	0.008	0.008	E	0.008	E	69	130	60
15	0.028	48	0.006	0.004	0.010	0.010		0.001		65	133	51
16	0.034	28	0.000	0.000	0.036	0.036		0.000		66	133	65
17	0.031	14	0.000	0.000	0.026	0.026		0.000		66	136	53
18	0.032	8	0.000	0.000	0.031	0.031		0.000		65	132	58
19	0.041	4	0.000	0.000	0.039	0.039		0.000		63	133	71
20	0.050	23	0.030	0.000	0.029	0.029		0.030		69	143	81
21	0.036	34	0.000	0.000	0.025	0.025		0.000		63	138	62
22	*	*	0.027	0.004	0.018	0.018		0.022		*	*	*
23	0.038	67	0.029	0.007	0.000	0.000		0.022		65	145	53
24	*	*	*	*	*	*		*		*	*	*
25	*	*	*	*	*	*		*		*	*	*
26	*	*	*	*	*	*		*		*	*	*
27	*	*	*	*	*	*		*		*	*	*
28	*	*	*	*	*	*		*		*	*	*
29	*	*	*	*	*	*		*		*	*	*
30	0.043	69	0.035	0.007	0.006	0.006		0.028		64	136	63
31	0.051	80	0.042	0.008	0.008	0.008		0.034		65	139	73
SUM	1.115	-	0.450	0.155	0.608	0.608	N.A.	0.295	N.A.	-	-	1983
AVG	0.036	44	0.015	0.005	0.020	0.020	N.A.	0.010	N.A.	67	133	64
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: ORTIZ AND REILL, LOT 8 ESCONDIDO, CA SOLAR/1087-78/12
REPORT PERIOD: DECEMBER,1978

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.048	88	0.042	0.009	0.005	N	0.011	-0.002	0.070	68	52
2	0.008	0	0.000	0.001	0.008	O	0.018	0.000	0.000	68	51
3	0.016	-2	-0.000	0.002	0.015	T	0.030	0.000	-0.000	63	50
4	0.014	0	0.000	0.002	0.014		0.027	0.000	0.000	67	52
5	0.035	0	0.000	0.008	0.035	A	0.062	-0.001	0.000	67	49
6	0.074	64	0.047	0.011	0.031	F	0.055	-0.002	0.079	68	43
7	0.060	0	0.000	0.011	0.060	F	0.104	0.000	0.000	66	41
8	0.072	0	0.000	0.012	0.072	L	0.123	0.000	0.000	68	44
9	0.023	0	0.000	0.004	0.028	I	0.050	0.000	0.000	68	47
10	0.057	0	0.000	0.009	0.057	C	0.099	0.000	0.000	74	58
11	0.016	0	0.000	0.002	0.015	A	0.017	0.000	0.000	68	61
12	*	*	*	*	*	B	*	*	*	*	*
13	0.058	0	0.000	0.020	0.060	L	0.103	0.000	0.000	76	57
14	0.051	0	0.000	0.010	0.049	E	0.085	0.000	0.000	76	56
15	0.049	0	0.000	0.011	0.049		0.083	0.000	0.000	73	50
16	0.031	0	0.000	0.009	0.031		0.054	0.000	0.000	71	55
17	0.019	0	0.000	0.007	0.029		0.052	0.000	0.000	75	55
18	0.043	0	0.000	0.007	0.036		0.063	0.000	0.000	73	50
19	0.059	0	0.000	0.012	0.061		0.105	0.000	0.000	72	45
20	0.070	0	0.000	0.018	0.070		0.110	-0.000	0.000	76	45
21	0.055	0	0.000	0.010	0.055		0.095	0.000	0.000	70	47
22	0.018	0	0.000	0.003	0.018		-0.107	-0.000	0.000	69	50
23	0.020	0	0.000	0.003	0.019		0.037	0.000	0.000	66	52
24	*	*	*	*	*		*	*	*	*	*
25	*	*	*	*	*		*	*	*	*	*
26	*	*	*	*	*		*	*	*	*	*
27	*	*	*	*	*		*	*	*	*	*
28	*	*	*	*	*		*	*	*	*	*
29	*	*	*	*	*		*	*	*	*	*
30	0.024	0	0.000	0.003	0.023		0.043	0.000	0.000	65	51
31	0.045	10	0.004	0.008	0.040		0.071	-0.001	0.007	71	48
SUM	1.248	-	0.121	0.247	1.137	N.A.	1.798	-0.007	0.202	-	-
AVG	0.040	10	0.004	0.008	0.037	N.A.	0.058	-0.000	0.007	70	50
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: ORTIZ AND REILL, LOT 8 ESCONDIDO, CALIFORN SOLAR/1087-78/12
REPORT PERIOD: DECEMBER,1978

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	283	N	52	58	N	N	N
2	1973	O	51	67	O	O	O
3	2023	T	50	68	T	T	T
4	1970		52	70			
5	385	A	49	57	A	A	A
6	1979	P	43	53	P	P	P
7	1924	P	41	52	P	P	P
8	1986	L	44	52	L	L	L
9	1968	I	47	64	I	I	I
10	1902	C	58	74	C	C	C
11	2205	A	61	*	A	A	A
12	*	E	*	*	E	E	E
13	1969	L	57	79	L	L	L
14	1807	E	56	76	E	E	E
15	620		50	66			
16	961		55	69			
17	150		55	*			
18	186		50	*			
19	1146		46	50			
20	1752		45	*			
21	1459		47	63			
22	1829		50	70			
23	2640		52	69			
24	*		*	*			
25	*		*	*			
26	*		*	*			
27	*		*	*			
28	*		*	*			
29	*		*	*			
30	1929		51	66			
31	1802		48	65			
SUM	47596	N.A.	-	-	-	-	-
AVG	1535	N.A.	50	64	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

UNIVERSITY OF FLORIDA
3 1262 09052 6491

☆ U.S. G.P.O. 1979—640-189/4206